

AGRICULTURAL ENVIRONMENTAL MANAGEMENT MODEL IN THE TERM OF SUSTAINABLE AGRICULTURE ACHIEVEMENTS IN TAEBENU, KUPANG DISTRICT

Hendrik Ernantje

ABSTRACT

Farmers in carrying out their farming will always interact with the surrounding environment, and that the surrounding environment is maintained continuity required sustainable farming. Therefore, farming activities should be supported by the actions of good environmental management and sustainable agriculture from farmers as the main actors in agricultural development. Environmental management measures that farmers in general is influenced by various factors, such as the use of environmentally friendly technologies available. It is thus important in a farm to take advantage of technologies and practices that have been proven relevant to increase production, and sustainability.

The first year study conducted with a focus on the discovery of the agricultural environment management model. The purpose of this study was to determine the environmental management of agriculture on farm households in the district Taebenu, kabupaten Kupang, and the formulation of a model management environment are agriculture (agri-environmental). Descriptive method used in this study is a troubleshooting procedure investigated by describing / depicting the state of the subject / object of research (person, organization) at the present time based on the facts that appear or as it is. Forms deskriptif method, this research used descriptive method form: Survey

The population in this study were farmers in the subdistrict Taebenu Kupang district, stratified sample proportion determined by random sampling, yaiu population is grouped into several strata with specific criteria, then sampling selected randomly. 1. The data was collected through a qualitative approach conducted with research interviews with respondents and focus group discussions (FGD) to dig out the required information. 2. Quantitative approach is done by using a structured questionnaire. Path Analysis (Path analysis) is used to determine the factors that affect the management of the agricultural environment and formulate a model of agricultural environmental management.

The results showed that the farm run by respondents is characterized by dry land farming (farming fields), yards, rainfed, irrigated fields and a mixture known as Mamar (traditional agroforestry) with agricultural environment management of respondents in middle category with an average management score 21.88; Factors that affect the agricultural environment management are: farming experience, household size and age while factors that are not affect the agricultural environment management are :education, land size and income; Agricultural Environmental Management Model that was obtained by the path analysis of the relationship between each variable path has direct relationship that is positive, the model does not differ significantly from the model so that it can be concluded saturated developed model has a good fit in the development of the agricultural environment management model.

Keywords: management, agricultural environment, model

1. INTRODUCTION

Farmers in carrying out their farming will always interact with the surrounding environment, and that the surrounding environment is maintained continuity required sustainable farming. Therefore farming activities should be supported by the actions of good environmental management and sustainable agriculture from farmers as the main actors in agricultural development. Environmental management measures that farmers are generally influenced by internal and external factors such as the use of environmentally friendly technologies available. It is thus important in a farm to take advantage of technologies and practices that have been proven relevant to increase production, and environmental sustainability of agriculture.

Sustainability of the agricultural environment is a shared responsibility between the government and the community, especially the farming community. Therefore, the government has issued many regulations related to the environment that certainly includes the agricultural environment. In Act no. 4 1982; Law no.32 of 2009, about the basic provisions for environmental management stated that every person has the right to a good environment and healthy. In addition, the law also states that every person has a duty to preserve the environment and prevent and mitigate damage and pollution that may occur. One of the aims of environmental management according to the law is the implementation of sustainable development for the benefit of present and future generations.

Although the concept of sustainable development including sustainable agricultural development is a shared commitment that must be complied with and implemented, in fact, still has not achieved satisfactory results. This is evident from the number of research reports that show that farmers still farm implement with an unsustainable pattern. Hendrik (2015), Nazarian (2013), for example, in a study obtained results indicate that farmers are some characteristics of the respondents did not correlate significantly with the behavior of environmental safety in the use of pesticides, as well as in the management of agricultural land.

The research result Olewiler also shows that, although farmers receive little support for his efforts to maintain and scaling up of resources that benefit society., Olewiler pointed out that, since farmers generally

do not accept payment to benefit the ecosystem arising from land and farming engineering, farmers have the ability low to protect nature (nature). In addition, a low understanding of how changes in farm management will increase the "natural capital" and also provide benefits to the farm (Olewiler 2004 pg. 17 quoted Mackenzie, 2008).

Environmental Management to do in farming is reflected in the maintain of physical, chemical and biological soil remains good, crop rotation precisely, mixed cropping and integration of crops with livestock, increasing the population of soil microorganisms through the use of organic fertilizer, recycling of waste into organic fertilizer, manure, straw and other agricultural wastes that during this is considered waste and handling rubbish which is unused leftover materials from agricultural activities.

Taebenu subdistrict in Kupang district with an area of 106.89 km² in 2015 had a population of 17.388 people, consisting of men 8623 man and woman 8765 people, from this amount are 6693 people work as farmers, spread on 8 Village, and population density 163per km². There Taebenu dikecamatan Nature Park covering an area of 37 ha, as a conservation and water supply for the people of the district and the city of Kupang for their spring that flows throughout the year. Because most people Subdistrict Taebenu life of farming it is important to know the characteristics of farming and agricultural environment management model, mainly located around TWA.

2. METHODS

Descriptive method used in this study is a problem solving procedure investigated by describing the state of the subject / object of research (person, organization) at the present time based on the facts that their appear as (Nawawi, 2003, p: 63). Of the three forms dsriptif methods, this study used a descriptive method form: .Survey (Survey Studies)

Research done in the District Taebenu Kupang district. Data collected consist of primary data (data obtained from the measurement / recording researcher) and secondary data (data obtained from quoting the records of others / specific agencies)

Sampling technique used in this study is the simple random sampling technique that is waged a random number in the selection of the sample, based on the number of community workers / producers and owners of agricultural land in the village Baumata, Baumata Village East and North Baumata village. Presentation of data in tabular form or frequency distributions and cross-tabulations (Crosstab), with this analysis will be known tendency of research findings, whether in the category of low, medium or high. As a basis for

determining sample size a sample size determination method will be used based on population size. To determine the number of samples with the size of the population known to use the Slovin formula (Sevilla, 1994 in Umar, 2002.pg.133) are as follows:

$$n = \frac{N}{1 + N e^2}$$

Where :

n = sample size
N = population
e = error taht can be tolerated

With a population of 792 people and $e = 0.1$, So the number of samples in this study = 215 people. Reliability test results show that instrument reliability = 0.747, including in the "High" category, so that research instruments can be trusted to give results according to what will be measured

3.RESULT AND DISSCUSION

Agriculture Environmental Characteristics

The results showed that respondents run agriculture characterized dryland agriculture (field farming), yards, rainfed rice fields, irrigated rice fields and mixtures known as Mamar (traditional agroforestry). the types of plants cultivated are rice, corn, cassava, vegetables, peanuts, rice beans, papaya, banana, coconut, cashew, breadfruit and areca nut. The management of the respondent's agricultural environment in the medium category with an average management score of 21.88; Farming patterns carried out by respondents are wetland farming patterns or paddy fields and dry land farming patterns with, the types of crops cultivated are rice, corn, cassava, vegetables, peanuts, rice beans, papaya, banana, coconut, cashew , breadfruit and areca nut. Cropping patterns for rice, maize, peanuts and vegetables are generally planted with Intercropping patterns, where two or more plants are planted on the same land in the same period of time without different rows of lines.

Soil Management

The results of data analysis showed that the respondents who did the minimum tillage were 130 people (60%), the maximum tillage was 30 people (14%) and no tillage as many as 55 people (26%). Maximum

soil treatment by respondents using tractors or hoes in farming. Soil processing techniques carried out by respondents as shown in the following figure.

This result was also supported by the results of the FGD in Baumata Village and North Baumata Village, Experience from Mr. David - one of the farmers participating in the FGD from Baumata Village:- "For rice planting, hijacking with tractors, and arranging beds and irrigation in accordance with what was taught by the previous extension workers. Spraying is done every 15 days, fertilizing with urea & TSP fertilizer:- Planting corn with a distance of 30-40 cm, 02 seeds, fertilized gradually after 15 days of spraying, after 30 days after fertilizing with urea & TSP fertilizer.- In addition to planting vegetables, also planting onions on land of 4 acres and not using chemical fertilizers using only cow dung- Spraying pests according to the recommended dosage, carried out every 15 days to prevent pests from attacking plants " The minimum tillage is done by hoeing the soil on the row to be planted as wide as 30-40 cm. Some results of the study show that minimum tillage applied to lightly textured soils does not provide a difference in results which means compared to perfect soil treatment. Generally the respondents do minimum tillage on land planted with corn and horticultural plants, while for rice plants tillage is carried out using a tractor. Mr Zakarias - head of the Numamese farmer group in Baumata village: "In planting rice, the resulting yellow is. Then the land is processed and mixed using burnt lime after 2 years the yield of the planting has been better "

Plant rotation

The number of respondents who carried out crop rotations was 36 people (16.7%), while those who sometimes implemented 122 people (56.7%), and who never did. 57 people (26.5%). In fig.2 it can be seen the distribution of respondents doing crop rotation. This result is also seen from the results of the FGD, for example the experience of one FGD participant with rice and peanuts.

Experience from Mr. Imanuel Kase - one of the baumata village farmers: two years ago planted peanuts, using tractors to loosen the soil, but did not get satisfactory results; the peanut plants are all white, the leaves are fertile and 50 cm high, but there are no results. The land used is 36 acres, which was previously used to grow rice, after harvesting a few months later burned and the soil was tractor to plant peanuts. Using urea and TSP fertilizer when planting rice, but do not use any fertilizer when planting peanuts- The following year planting peanuts again but without land piracy, instead getting more satisfying results. 36 acres produce 18 sacks for peanut harvests "Deputy chairman of farmer groups from North Baumata village " "During the summer only planting corn" besides the other corn plants which are also planted are peanuts, pumpkins, tomatoes and rice beans. Yermes Meke – Farmer from RT 01/RW 01/ Dusun 01 baumata village

: "Doing rice planting naturally, after rice is harvested, after that will plant corn, beans, pumpkins on the land". In the following picture it can be seen the distribution of respondents doing crop..rotation.

Use of Organic Materials

For the question whether respondents leave / use crop residues in farming land as ground cover organic matter, 61 people (28.4%) answer frequently, 95 people (44.2%) answer occasionally, and 59 people (27.4%)) answer never. The distribution of respondents in the use of organic material as ground cover in the research location can be seen in figure 5.15. Some FGD participants conveyed their experience in farming rice straw or stems and leaves of maize given to livestock, or burned, but there were also those who simply left in the fields or fields. The chairman of the Nekafmese farmer group, east baumata village (Mr. Corinus) said:- " Corn stalks and leaves after being cut are used for cow food. If there are corn stalks left after being cut, just leave it "Deputy chairman of the North Baumata Farmer Group:- "Planting corn with method 03 perforated seeds, with a distance of 30-40 cm, after 4 days the plants are sprayed with pesticides, fertilizing every 2 weeks, stems & leaves for cow feeding after harvest. In addition to corn, pumpkin, peanuts, tomatoes, rice beans, and during the summer only plant corn, using sidametri to spray red ants. Water source from central baumata "Chairman of the North Baaumata Farmer Group (Mr. Nimrod):"When harvesting corn, the leaves will be taken for cow food, while the stem left after the dry is just taken "

Use of Fertilizers

Fertilizer types used by respondents are composed of organic and inorganic fertilizers. Types of organic fertilizers are animal manure, compost and bokashi. While inorganic is used such as Urea, KCL, TSP. Organic fertilizers such as bokashi, compost and animal manure are more widely used in horticulture crops, especially vegetables, while Urea inorganic fertilizers, TSP and KCL, are mostly applied to rice and corn plants with varying frequency of use, from 2-6 times per season. planting. Distribution of respondents based on fertilizer use and application to plants can be seen in table 1.

In focus group discussions, several participants expressed their experience using fertilizers, both organic and inorganic fertilizers. The chairman of the East Oleo Baumata farmer group said;- "For corn planting, it follows the same process / pattern as the northern baumata farmer group; 02 seeds with a range of 30-40 cm, the results of the last 02 years are quite satisfying by using chicken manure as fertilizer, the main obstacle is the emergence of pest black spots on plants,- Vegetable plants use only manure " *The chairman of the Nekafmese farmer group, east baumata village said:- "Planting corn is the same as Mr. Nimrod; 02 seeds,*

local seeds, with a distance of about 30-40 cm. The first planting uses 01 sacks of urea fertilizer, TSP fertilizer half sack, second planting using urea fertilizer 01 sacks and squeeze NPK half sacks, & TSP fertilizer for land area of 11-16 acres, yields of planting do not produce enough or capital does not return "Mother counselor from east baumata village said:- "In east baumata, every RT / hamlet has been formed / promoted by a team of women who work on making bocations, mostly planting vegetables in the eastern baumata area using bocation"Mr. Daud - one of the FGD participant farmers in Baumata Village said : "For planting rice fertilizers with urea and TSP fertilizer- Planting corn with a distance of 30-40 cm, 2 seeds, fertilized gradually after 15 days of spraying, after 30 days of fertilization with urea and TSP fertilizer.- In addition to planting vegetables, and also plant onions on an area of 4 acres and not use chemical fertilizers using only cow dung "

Pattern of Use of Pesticides

The types of pesticides used by respondents consist of chemical and natural pesticides, the chemical pesticides used are Alamo: rice paddy, Alika isicidal for onions, chili, corn and long beans, Boxer in the application of onion and chili plants, Dursban utuk chili, onion , corn, green beans, peanuts, Eksplora: Fungicides, shallots, chillies, corn, long beans, Furadan: Systemic insecticides and Nematicides, rice, tomatoes, Gibgro: growth regulators, maize, Matador in applications on shallots, chili, long beans, corn, mipsin in rice plants, Sidamethrin is used in maize and mustard greens, and Virtako is used in shallots, chili plants. Besides, the most commonly used types of herbicides are roundup of respondents to the grass plant pests. Application is done by measuring using bottle caps, 1 cap is watered and sprayed on plants, and is generally used for spraying the frequency of 1-2 times the perming plant. The result showed 132 respondents (61.39%) reported each wearing a planting season, 54 people (25.12%) stated that sometimes the chemistry receipts, while 29 (13.49%) of respondents used pesticides for the cultivated plants. Distribution of respondents based on the use of pesticides such as in table 2.

Of the total respondents there are 38 states ever using natural pesticides, and from the results of focus group discussions participants also expressed using natural pesticides in addition to chemical pesticides following what the FGD about using pesticides:

Farmer groups Baumata north (father nimrod) said:

"Planting corn that is mixed with some kind of drug furadan, after growing or after 01 weeks of fertilization are pests in roots, Furadan use only one at the time of planting. Despite using furadan, still there are pests that attack the roots, leaves and even does not produce fruit at all "

Farmer groups Baumata east said:

-Disinfect (white) or pest diakar. Already using stimulant drugs are also drugs boxer, but pest problems remain.

Vice chairman of the North Baumata farmer groups said: "Planting corn 3 seeds per hole, with a distance of 30-40 cm, after 04 days plants sprayed with pesticides, fertilizing every two weeks, stems and leaves to cattle after harvest. In addition to planting corn squash, beans, tomatoes, beans rice, during the summer just to plant corn, using Sidamethrin for spraying ants.

Mr. Zacharias - farmer groups nekamese said:

-For pest white butterflies do not use chemical drugs but uses tobacco marinade (sprayed), after it was all white butterflies disappear

-For root caterpillar pests, using medicinal chemistry / furadan no effect, akhirnya using the bark of the tree trunk Langkawi (mostly found in north Amarasi), the bark of trees planted directly in soil newly sprayed or soaked

Baumata eastern extension of the village said:

-Already advise / educate the community to return to the sphere or using natural pesticides, as well as natural fertilizers, natural pesticides manufacture using kitchen spices such as serei, etc.

-Constraints on the pests in the soil, including slugs / snails become one of the major problems for farmers

Use of Certified Seed

The seeds used in farming consist of certified seeds and seeds produced by themselves from the previous planting season. The results of data analysis showed that 111 people (51.63%) respondents always used certified seeds, 65 people (30.23%) respondents stated that sometimes they only used certified seeds, especially for vegetable crops, while 39 (18.14%) people respondents said using only seeds produced from the previous planting season, Distribution of Respondents Based on Use of Certified Seeds can be seen in table 3 .

Participants of the focus group discussions father Zacharias who is the head of the farmer group nekamese, menyatakan the following in relation to the seeds or seedlings:

"Planting onions: onions irrigated which can not be used as a seed, but the onion plants are watered only can still be reused as a seed, so the plants watered onions sold while flushing the results used to seed.

Agricultural Waste Management

In dealing with rubbish such as bottles, cans or plastic pesticide or fertilizer, of the total respondents, 91 people (42.33%) were both throw away the surrounding rice fields, 86 people (40%) buried in the ground, while 38 people (17.67%) said insert in a plastic bag to be disposed of in municipal waste place. To the question whether respondents separate garbage like sticks, twigs and leaves (organic) from waste plastic, cans and bottles (inorganic), 52 (24.19) of respondents menatakan often separate organic waste from inorganic waste, 123 (57.21%) respondents stated that sometimes separate garbage, and 40 (18.60%) said never separate the organic and inorganic waste.

Discussion of the cans of pesticides or insecticides / plastic bottles and medicine bottles FGD grass, -"Trash for most pesticide bottles thrown away, dumped behind the house, or a plastic bottle in the fuel, the method of disposal depends on individual farmers, mostly burned"

Agri-Environmental Management

The average score obtained Environmental Management Agricultural respondents is 21.88 with a minimum score of 15.00 and a maximum score obtained 29.00. With a standard deviation of 3.96, the score acquisition of respondents can be classified into three categories, each category of Environmental Management Agricultural High with a score of > 26.00, the medium category with a score of 18.00 -26.00 and low category with a score of <18 , 00.

The results of data analysis showed that 47 people (21.86%) respondents were in the high category in obtaining scores on agricultural environmental management, 135 people (62.79%) respondents were in the moderate category, and 33 people (15.35%) belonged to low category. In Agricultural Environmental Management (see table 4).

Factors Affecting Environmental Management of Agriculture

In this study there were five variables that measured the effect on the Agricultural Environmental Management. Chi square value = 0.041, df = 1 and P = 0.840 greater than 0.05; indicates that the chi-square results are not statistically significant. This means that the model is consistent with the data. The figure in the figure 4.

Estimates of the statistical significance of each parameter to track installed in the model is one of the important criteria for known. Significance can be seen by calculating the critical value, which is obtained by dividing the standard error of parameter estimation by each value. Critical values calculated together with the corresponding p-values are presented in figure 4 Regression weights for all the significant variables with the exception of income .. In addition, another thing to consider at this stage is the magnitude

and direction of the parameter estimates. In this model all weights positive regression showed a positive correlation between variables

In the following table can be seen the test results of multiple regression for factors - factors expected to affect respondents in Environmental Management.

From table 5, it shows that age has a CR value of 6.079, greater than 2.56. Then aged very significant influence on agricultural environmental management at 1% significance level, the number of family members with 2,005 CR value is greater than 1.96, significant at the 5% level ($p = 0.045 < 0.05$); Older CR value farming that show how farming is a larger 2,052 dari 1,96 so this variabel significant effect on agricultural environmental management at the level of 5% ($p = 0.040 < 0.05$)., This shows that the most important variable to explain the Agricultural Environmental Management is aged.

Whereas Education with a CR value of 0.440 ($p = 0.660 > 0.05$), land area with a value of CR 0.775 ($p = 0.438 > 0.05$) and income with a CR value of -0.120 ($p = 0.905 > 0.05$) is a variable- variable that does not significantly influence the management of the agricultural environment. From the results of the analysis also obtained direct or indirect effects of research variables which can be seen in table 6.

From the table shows that the variable land area, old farming, education, age, number of family members have a direct positive effect is greater than the indirect effect on agricultural environmental management. Nonetheless, from the table also shows that the education has a negative indirect effect (-0.002) on agricultural environmental management, as well as the number of family values hanggota indirect negative effect (-0.001). This means that any increase in the education variable and the number of family members will lead to decreased income variables which affect the agricultural environment management.

Agricultural Environmental Management Model

In Figure 5 which is an ideal conformity with all possible paths. A model can be defined as good if not differ significantly from saturated models. To find out if the model does not differ significantly from saturated there are several indices explanatory models that can be used. Value is the value in the model referred to as value CMIN / DF, RMR, GFI, NFI, PRATIO, RMSEA. From the results of the analysis of these values as presented in table 7.

The number of parameters in the model is 27, consisting of 20 coefficients for each path and 7 variances for each variable, as shown in the following figure 5:

CMIN one model accuracy index is relative chi-square value that indicates how much the suitability of the data to the model, by issuing one or more path, the index indicates the number 0,041 in the model this means the data according to the model developed.

To find out how much the index variance and covarians in different models of variance and covarians observations, it can be seen from the value of RMR or the root mean square residual in this research model index RMR 0.733 which means variance and covarians in the model is not much different from the variance and covarians observations, The smaller the RMR index, the better the resulting model.

Goodness of Fit Index (GFI) is an index that shows the suitability of the model, this value must be more than 0.9 for a good model. From the table, it can be seen that the GFI value is 1,000, which means that the model developed is good. Furthermore, the value that is also important to determine the suitability of the model developed is the value of the Normed Fit Index (NFI), which is the difference in chi-square two models divided by chi-square of independence model. NFI values of 0.9 or more indicate the resulting model is good. The NFI value of 0.1000 from the model developed shows that the model is good. this means that several conformity indices discussed show the same results that the model being developed is a good model. Furthermore, the value of the Root Mean Square Error of Approximation (RMSEA), also a number that indicates the suitability of a model against the saturated model, the RMSEA value smaller than 0.05 indicates good suitability, and 0.05-0.08 is quite appropriate. The RMSEA value of the model in this study was 0,000 <0,05, meaning the model showed good suitability. The suitability of the model developed also means that the model of agricultural environmental management with measurements on tillage, crop rotation, use of organic matter, fertilization, use of pesticides, use of certified seeds, management of agricultural waste is significantly affected by age (99% confidence level or very significant), number of family members and length of farming (95% confidence level or significant). These results also support the results of the Efrita and Sudrajat (2012) study, which states that longer farmed factors associated with the level of experience in managing their farms, showed a positive trend and a real relationship. Income affects negatively to environmental management, these results are also consistent with the results of research MacLean (2014), who will choose the options for farm operations are cheaper with activities that will benefit the surrounding environment, but often options on farming environmentally friendly and more activities are expensive not considered to be selected farmers to use. Further studies of Financial Responsibility vs. the Natural Environment It also reported that financial considerations are "the bottom line" in making choices farming. This method requires that balancing the financial needs of the family, and

the farmer draw a line on a job taking care of the environment or the bottom line of work taking care of the farm and its resources, as a comparison.

4. CONCLUSIONS AND RECOMMENDATIONS

Conclusion

From the discussion above it can be concluded:

1. Agricultural activities carried out by respondents are characterized by dryland agriculture (field farming), yards, rainfed rice fields, irrigated rice fields and mixtures known as Mamar (traditional agroforestry) with the management of the respondent's agricultural environment in the medium category
2. Factors that influence the management of the agricultural environment are: old farming, number of family members and age while the factors that do not influence are education, land area and income
3. The management model of the agricultural environment obtained by path analysis path relationship between each variable has a positive direct relationship, the model does not differ significantly from the saturated model so it can be concluded that the model developed has good suitability in the development of agricultural environmental management models.

Recommendations

1. Agricultural environmental management such as land management, use of organic matter, crop rotation, use of fertilizers, pesticides and waste management handling is further enhanced towards more sustainable.
2. Although some of the factors in this study have no effect on agricultural environmental management, but it has a positive direct relation to environmental management, because it will still be considered.
3. However, further research should be done on the application, and the determination of the sample according to the model that has been obtained

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